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9 UNITED STATES DISTRICT COURT
10 FOR THE NORTHERN DISTRICT OF CALIFORNIA
11 OAKLAND DIVISION

12 TOBII TECHNOLOGY AB,

13 Plaintiff,

14 v.

15 THE EYE TRIBE APS,

16 Defendant.
17

Case No: C 13-05877-SBA

CLAIM CONSTRUCTION ORDER

18
19 Plaintiff Tobii Technology AB (“Plaintiff”), a developer of eye gaze tracking
20 technology, holds the rights to U.S. Patent No. 6,659,611 (“the ’611 patent”). The patent
21 discloses a system and method for eye gaze tracking using corneal image mapping.
22 Plaintiff brings the instant patent infringement action against Defendant The Eye Tribe APS
23 (“Defendant”), seeking a declaration that Defendant’s products infringe the ’611 patent.
24 Dkt. 1. In turn, Defendant counterclaims for a declaration of non-infringement. Dkt. 27.
25 The parties are presently before the Court for construction of the ’611 patent claims. On
26 November 19, 2015, the Court conducted a claims construction hearing. Each party
27 appeared through counsel of record. Upon consideration of the parties’ arguments and the
28 claim construction briefs filed in connection with this matter, the Court finds as follows.

1 **I. BACKGROUND**

2 **A. THE '611 PATENT**

3 Eye gaze tracking technology allows a device or computer equipped with an eye
4 tracker to determine where a user is looking. This makes it possible for users to interact
5 with computers and machines using their eyes (as opposed to, or in addition to, using other
6 input modalities, e.g., a keyboard, touchpad, or mouse).

7 Traditional “corneal reflection” gaze tracking systems “project light toward the eye
8 and monitor the angular difference between pupil position and the reflection of a light beam
9 from the cornea surface.” ’611 patent, col.1, ll.51-53. The light reflected from the eye has
10 two major components--glint and retroreflection. Id., ll.56-66. Glint is a very small and
11 very bright image of a light source reflected off the surface of the corneal bulge. Id.
12 Retroreflection is light that enters the eye and is reflected back out from the retina,
13 illuminating the pupil from behind and causing it to appear as a bright disk against a dark
14 background. Id. This retroreflection, or “bright eye” effect, allows a camera to take a very
15 high contrast image of the eye. Id. Capturing a series of such images, a gaze tracking
16 system locates the center of the pupil and the glint, and measures the change in distance and
17 direction between the two points as the eye rotates. Id., col.1, ll.66 to col.2, ll.2.

18 With regard to the ’611 patent, a preferred embodiment of the invention “includes
19 two uncalibrated cameras imaging the user’s eye and having on-axis lighting.” ’611 patent,
20 cover sheet. “The cameras capture images of a test pattern in real space as reflected from
21 the user’s cornea, which is essentially a convex spherical mirror. The invention then
22 extracts parameters required to define a mathematical mapping between real space and
23 image space, including spherical and perspective transformations. The invention processes
24 subsequent images of objects reflected from the user’s eye through the inverse of the
25 mathematical mapping to determine a gaze vector and a point of regard.” Id. Alternative
26 embodiments of the patented invention include a single calibrated camera with means for
27 estimating the eye-to-camera distance or a head-mounted camera with a laser pointer. Id.
28

Figures Four and Five, reproduced below, depict a preferred embodiment of the invention. '611 patent at figs. 4-5. This embodiment shows the user's eye (400), including the cornea (402), pupil (404), pupil center "P" (406), and glint "G" (408). The user's eye reflects a set of reference points (410) or "test pattern" (412). Also shown is at least one camera (500), including a focal center "F" (502), an image plane defining an image coordinate system (504), and an on-axis light source (not shown), as well as a display screen (510), preferably modeled as plane "S" (512). The point of regard "T" (508) falls at the intersection of the gaze vector (506) and the screen plane. The gaze vector bisects angle FPV, where "V" (514) represents a virtual light source whose reflection from the eye would appear to coincide with the pupil center in the image plane of the camera.

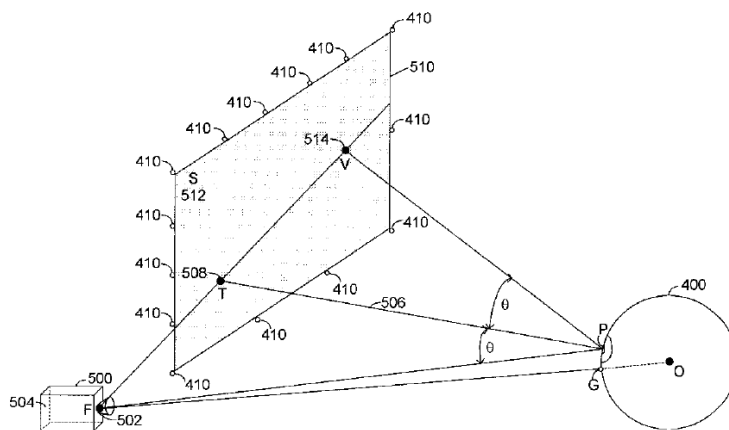


Figure 5

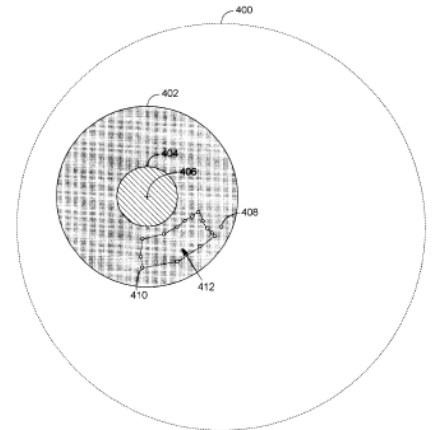


Figure 4

As is pertinent here, the '611 patent discloses three independent claims: Claims 1, 14, and 15. Claim 1 recites:

A method for eye gaze tracking, comprising the steps of:
 creating a set of reference points in a reference coordinate system;
 acquiring at least one image of at least one of a user's corneas, said image having image aspects in an image coordinate system and including reflections of said reference points;
 defining a mathematical relationship between said reference coordinate system and said image coordinate system;
 mapping said image aspects from said image coordinate system to said reference coordinate system using said mathematical relationship; and
 computing a point of regard from said mapped image aspects.

1 '611 patent, col.10, ll.6-21. Claim 14 tracks the language of Claim 1, except that the phrase
2 “means for . . .” begins each element. Id., col. 11, ll. 1-14 (e.g., “*means for* creating a set of
3 reference points in a reference coordinate system”) (emphasis added). Similarly, Claim 15
4 largely tracks the language of Claim 1, except that the phrase “a
5 [first/second/third/fourth/fifth] code means for . . .” begins each element. Id., col.11, ll.15
6 to col. 12, ll.17 (e.g. “*a first code means for* creating a set of reference points in a reference
7 coordinate system”) (emphases added).

8 **B. PROCEDURAL HISTORY**

9 On December 18, 2013, Plaintiff initiated the instant infringement action against
10 Defendant, alleging that Defendant’s products infringe one or more the ’611 patent claims,
11 including Claim 14. Compl., Dkt. 1. Defendants answered and filed a counterclaim,
12 denying infringement. Am. Answer & Countercl., Dkt. 27. On December 23, 2014, the
13 parties filed a Joint Claim Construction and Prehearing Statement. Dkt. 49. The parties
14 subsequently amended the Joint Statement, Dkt. 53, and filed their respective claim
15 construction briefs, Pl.’s Opening Br., Dkt. 54; Def.’s Response Dkt. 56; Pl’s Reply,
16 Dkt. 57. A claim construction hearing was initially set for May 2015; however, the parties
17 later stipulated to continue the same.

18 On October 6, 2015, the parties filed an Amended Joint Claim Construction and
19 Prehearing Statement (“Joint Statement”), narrowing their disputes. Dkt. 86. In the
20 operative Joint Statement, the parties dispute the construction of the terms and phrases:
21 (1) “reference points”; (2) “image aspects”; and (3) “said image having image aspects in an
22 image coordinate system and including reflections of said reference points.” The parties
23 also dispute the definiteness of elements in Claims 14 and 15, disagreeing as to whether the
24 patent provides corresponding structure for the functions disclosed therein.

25 On November 19, 2015, the Court held a claims construction hearing. After
26 discussion with the Court and each other, the parties agreed on the record to the following:

- 27 1. “Reference points” is construed to mean “points that form a test pattern”;
- 28 2. “Image aspects” is construed to mean “features of the corneal image”; and

1 3. “Said image having image aspects in an image coordinate system and
2 including reflections of said reference points” requires no construction.

3 The Court adopted the parties’ constructions as to the terms and phrases above. The parties
4 submitted the issue of indefiniteness on their briefs. See Minute Entry, Dkt. 87.

5 **II. DISCUSSION**

6 **A. CLAIM 14**

7 The parties dispute the validity of Claim 14, which contains five elements, three of
8 which are at issue. See Joint Statement, Ex. A at 7-11. The parties agree that Claim 14 is
9 subject to means-plus-function treatment, but disagree as to whether the patent discloses
10 corresponding structure for each of the claimed functions. Id.

11 A patentee may express an element of a claim “as a means or step for performing a
12 specified function without the recital of the structure, material, or acts in support thereof,
13 and such claim shall be construed to cover the corresponding structure, material, or acts
14 described in the specification and equivalents thereof.” 35 U.S.C. § 112, ¶ 6; see also
15 Triton Tech of Tx., LLC v. Nintendo of Am., Inc., 753 F.3d 1375, 1378 (Fed. Cir. 2014).
16 “In exchange for using this form of claiming, the patent specification must disclose with
17 sufficient particularity the corresponding structure for performing the claimed function and
18 clearly link that structure to the function.” Id.

19 Construing a means-plus-function claim is a two-step process. Noah Sys., Inc. v.
20 Intuit Inc., 675 F.3d 1302, 1311 (Fed. Cir. 2012). First, the court must identify the claimed
21 function. Id. Second, the court must look to the specification to identify the corresponding
22 structure. Id. “A structure disclosed in the specification qualifies as a ‘corresponding
23 structure’ if the specification or the prosecution history ‘clearly links or associates that
24 structure to the function recited in the claim.’ [Citation.]” Id. Here, the parties agree on
25 the claimed function of each element at issue, but disagree as to whether the patent
26 discloses corresponding structure.

27 A party alleging that the specification fails to disclose sufficient corresponding
28 structure must make that showing by clear and convincing evidence. See TecSec, Inc. v.

1 Int'l Bus. Machines Corp., 731 F.3d 1336, 1349 (Fed. Cir. 2013). “[A] patent is invalid for
2 indefiniteness if its claims, read in light of the specification delineating the patent, and the
3 prosecution history, fail to inform, with reasonable certainty, those skilled in the art about
4 the scope of the invention.” Nautilus, Inc. v. Biosig Instruments, Inc., 134 S. Ct. 2120,
5 2124 (2014). Thus, “a means-plus-function clause is indefinite if a person of ordinary skill
6 in the art would be unable to recognize the structure in the specification and associate it
7 with the corresponding function in the claim.” Noah Sys., 675 F.3d at 1312. Likewise, a
8 means-plus-function clause is indefinite if no corresponding structure appears in the
9 specification. Id. at 1313.

10 Where, as here, a claimed function “is performed by a general purpose computer or
11 microprocessor, then the specification must also disclose the algorithm that the computer
12 performs to accomplish that function.” Triton Tech, 753 F.3d at 1378; see also EON Corp.
13 IP Holdings LLC v. AT&T Mobility LLC, 785 F.3d 616, 623 (Fed. Cir. 2015) (“[W]hen a
14 patentee invokes means-plus-function claiming to recite a software function, it accedes to
15 the reciprocal obligation of disclosing a sufficient algorithm as corresponding structure.”).
16 “Failure to disclose the corresponding algorithm for a computer-implemented means-plus-
17 function term renders the claim indefinite.” Triton Tech, 753 F.3d at 1378. An algorithm
18 may be expressed “‘in any understandable terms including as a mathematical formula, in
19 prose, or as a flow chart, or in any other manner that provides sufficient structure.’
20 [Citation.]” TecSec, 731 F.3d at 1348. “However, ‘[s]imply reciting “software” without
21 providing some detail about the means to accomplish the function is not enough.’
22 [Citation.]” Id. at 1348-49.

23 With these principles in mind, the Court considers each disputed element in turn.

24 **1. “Means for Defining a Mathematical Relationship between Said**
25 **Reference Coordinate System and Image Coordinate System”**

26 Claim 14 describes a “means for defining a mathematical relationship between said
27 reference coordinate system and image coordinate system.” ’611 patent, col.11, ll.7-9. The
28 parties agree that the claimed function is “defining a mathematical relationship between the

reference coordinate system and image coordinate system.” The parties propose the following constructions of the claimed structure:

Plaintiff:	“[A] computer programmed to determine the transformations that cause reference points in the reference coordinate system to appear at specific relative positions in the reflected version of those reference points in the image coordinate system, and equivalents thereof.”
Defendant:	None disclosed.

The Court finds that the specification fails to disclose corresponding structure for the function at issue. Although capable of expression in many forms, an algorithm must be a “step by step procedure” for performing the claimed function. Triton Tech., 753 F.3d at 1379-80 (citing Ergo Licensing LLC v. Care Fusion 303, Inc., 673 F.3d 1361, 1363 (Fed. Cir. 2012)). The ’611 patent fails to disclose such a procedure. Plaintiff cites several places in the specification that it contends set forth the requisite structure. The cited excerpts explain that the patented software defines a mathematical relationship between the reference and image coordinate systems, but fail to explain *how* the software performs this function. See Function Media, L.L.C. v. Google, Inc., 708 F.3d 1310, 1318 (Fed. Cir. 2013) (finding insufficient structure where a patent “contain[ed] no explanation of how the . . . software perform[ed] the [stated] function”).

For example, Plaintiff primarily relies on the portion of the specification that states, “The invention maps or mathematically relates the test pattern image in the camera image coordinate systems to the actual test pattern through spherical and perspective transformation.” Opening Br. at 15-16 (quoting ’611 patent, col.4, ll.43-49). “Merely using the term [‘spherical and perspective transformation’] does not disclose an algorithm-- i.e., a step-by-step procedure--for performing the claimed function.” Triton Tech., 753 F.3d at 1378-79 (holding that the term “numerical integration” did not disclose an algorithm). Spherical and perspective transformation “is not an algorithm but is instead an entire class of different possible algorithms used to perform” mapping. Id. “Disclosure of a class of algorithms ‘that places no limitations on how values are calculated, combined, or weighted is insufficient to make the bounds of the claims understandable.’” Id.

1 Plaintiff further relies on the assertion that articles incorporated by reference into the
2 '611 patent "describe, to one of skill in the art, the structure of the claimed function."
3 Opening Br. at 16. Specifically, Plaintiff directs the Court's attention to "the *Zhang*
4 article," entitled "A Flexible New Technique for Camera Calibration." *Id.*; see '611 patent,
5 col.3, ll.2-8 (citing the *Zhang* article). Incorporation by reference is ineffectual, however.
6 Courts "cannot look to the prior art, identified by nothing more than its title and citation in
7 a patent, to provide corresponding structure for a means-plus-function limitation." *Pressure*
8 *Products Med. Supplies, Inc. v. Greatbatch Ltd.*, 599 F.3d 1308, 1317 (Fed. Cir. 2010).

9 Finally, Plaintiff asserts that the parties simply "disagree regarding the sufficiency of
10 the disclosure," and that Defendant has failed to meet its burden of proving that one of
11 ordinary skill in the art would not understand the disclosure of structure in the specification.
12 Reply at 11 (citing *Typhoon Touch Techs., Inc. v. Dell, Inc.*, 659 F.3d 1376, 1385 (Fed.
13 Cir. 2011) (holding that defendants failed to demonstrate indefiniteness in light of the lack
14 of evidence regarding the understanding of one of ordinary skill in the art). Plaintiff's
15 assertion lacks merit. See *EON Corp.*, 785 F.3d at 623-24 ("Where the specification
16 discloses no algorithm, the skilled artisan's knowledge is irrelevant."). Here, the issue is
17 not the *sufficiency*, but the *absence*, of structure disclosed in the specification. Plaintiff
18 therefore "cannot rely on the knowledge of one skilled in the art to fill in the gaps."
19 *Function Media*, 708 F.3d at 1319 (rejecting the plaintiff's reliance on *Typhoon* where the
20 specification disclosed no algorithm).

21 **2. "Means for Mapping Said Image Aspects from Said Image**
22 **Coordinate System to Said Reference Coordinate System"**

23 Claim 14 describes a "means for mapping said aspects from said image coordinate
24 system to said reference coordinate system." '611 patent, col.11, ll.10-12. The parties
25 agree that the claimed function is "mapping the image aspects from the image coordinate
26 system to the reference coordinate system." The parties propose the following
27 constructions of the claimed structure:
28

Plaintiff:	“[A] computer programmed to apply the mathematical relationship (as determined in the ‘means for defining’) to the image aspects, and equivalents thereof.”
Defendant:	None disclosed.

The Court finds that the specification fails to disclose corresponding structure for the function at issue. Plaintiff asserts that the structure is “a computer programmed to apply the mathematical relationship” defined in the prior element of Claim 14. Opening Br. at 17. In support of this construction, Plaintiff directs the Court’s attention to several portions of the specification that explain, in various permutations, “Once the invention defines the mapping . . . the invention *applies* the mapping to subsequent images reflected from the user’s cornea.” Opening Br. at 17 (quoting ’611 patent, col.5, ll.1-4 (emphasis added)). A means for “applying” a mathematical relationship, however, does not constitute an algorithm. This language says nothing about *how* the software performs this function. “As such, the language ‘describes an outcome, not a means for achieving that outcome.’” Blackboard, Inc. v. Desire2Learn, Inc., 574 F.3d 1371, 1384 (Fed. Cir. 2009) (quoting Aristocrat Techs. Australia Pty Ltd. v. International Game Tech., 521 F.3d 1328, 1334 (Fed. Cir. 2008) (holding that the purported structure was “only another way of describing the claimed function”)).

3. “Means for Computing a Point of Regard from Said Mapped Image Aspects”

Claim 14 describes a “means for computing a point of regard from said mapped image aspects.” ’611 patent, col.11, ll.13-14. The parties agree that the claimed function is “computing a point of regard from the mapped image aspects.” The parties propose the following constructions of the claimed structure:

Plaintiff:	“[A] computer programmed to (a) determine an angle between the focal center, a user’s pupil center, and a point on a predetermined target surface where a virtual light source would create a new image aspect at a pupil image center in the image coordinate system, (b) define a gaze vector as the bisector of the angle, and (c) compute a point of regard, which is the intersection of the gaze vector and an observed object (e.g., a display screen or computer monitor).”
Defendant:	None disclosed.

Whether the specification discloses sufficient corresponding structure for computing a point of regard from the mapped image aspects is not immediately apparent. On the one hand, Plaintiff cites passages of the specification that appear to describe an algorithm for computing a point of regard. Essentially, the invention maps point V, which represents a virtual light source corresponding to the pupil center of the reflected corneal image. See '611 patent, col.5, ll.1-14. The gaze vector bisects the angle between the focal center of the camera (or point F), the pupil center of the user's eye (or point P), and the virtual light source (or point V). Id. The point of regard (or point T), lies at the intersection of the gaze vector and the observed object. Id., col.6, ll.9-13.

As Plaintiff acknowledges, however, the invention "can compute the point of regard" only "[a]s long as a mapping between the reference coordinate system and the target coordinate system exists." Opening Br. at 17 (quoting '611 patent, col.7, ll.23-26). Thus, computation of a point of regard relies on the prior elements that *define* and *apply* the mathematical relationship between the reference coordinate system and image coordinate system. As stated above, the patent fails to provide corresponding structure for the defining and applying functions.

In any event, the Court need not decide whether the patent provides sufficient structure for the claimed function of "computing a point of regard from the mapped image aspects." "When the specification discloses an algorithm that only accomplishes one of multiple identifiable functions performed by a means-plus-function limitation, the specification is treated as if it disclosed no algorithm." Noah Sys., 675 F.3d at 1319. Here, the specification fails to disclose an algorithm that can accomplish each of the identified functions performed by the means-plus-function limitations. Structure is therefore lacking.

Accordingly, the Court finds that Claim 14 is indefinite.

B. CLAIM 15

The parties dispute the validity of Claim 15, disagreeing as to whether means-plus-function treatment is applicable. See Joint Statement, Ex. A at 11-13. If applicable, Claim

1 15 inevitably suffers from the same indefiniteness as Claim 14.¹

2 Use of the word “means” in a claim gives rise to a rebuttable presumption that the
3 patentee intended to invoke means-plus-function treatment, and thus, that Section 112, ¶ 6
4 applies. Sage Prod., Inc. v. Devon Indus., Inc., 126 F.3d 1420, 1427 (Fed. Cir. 1997).
5 Conversely, a claim term that does not use the word “means” gives rise to a rebuttable
6 presumption that the patentee did not intend to invoke means-plus-function treatment, and
7 thus, that Section 112, ¶ 6 does not apply. CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d
8 1359, 1369 (Fed. Cir. 2002). Here, each claim element at issue uses the term “means,”
9 thereby triggering a rebuttable presumption that the claims invoke Section 112, ¶ 6.

10 The presumption in favor of means-plus-function treatment is rebuttable in two
11 ways. Sage Prod., 126 F.3d at 1427. First, “where a claim uses the word ‘means,’ but
12 specifies no corresponding function for the ‘means,’ it does not implicate section 112.” Id.
13 Second, “where a claim recites a function, but then goes on to elaborate sufficient structure,
14 material, or acts within the claim itself to perform entirely the recited function, the claim is
15 not in means-plus-function format.” Id. at 1427-28. A claim recites sufficient structure if
16 persons of ordinary skill in the art would understand the words of the claim to designate
17 structure. TecSec, 731 F.3d at 1347.

18 Here, Claim 15’s elements use the phrase “a . . . code means” Plaintiff
19 contends that computer code constitutes sufficient structure for performing each of the
20 recited functions, and therefore, that the presumption in favor of means-plus-function
21 treatment is rebutted. Defendant argues that code does not constitute sufficient structure for
22 performing each of the recited functions, and therefore, that Section 112, ¶ 6 applies.

23 The Court finds that Claim 15 is a means-plus-function limitation. “Although [code]
24 represent[s] structure (in the form of software), it is not sufficient structure to perform the
25

26 ¹ If Claim 15 is a means-plus-function limitation, Plaintiff relies on its arguments
27 regarding Claim 14 to support its position that the specification provides corresponding
28 structure. See Opening Br. at 21 (“The corresponding structure that performs each of the
claimed functions in claim 14 would perform the same function in claim 15”).

entirety of the function.” Altiris, Inc. v. Symantec Corp., 318 F.3d 1363, 1376 (Fed. Cir. 2003) (holding that “commands,” in the form of computer software, did not constitute sufficient structure to rebut a means-plus-function presumption). “[M]erely pointing out that the relevant structure is software rather than hardware is insufficient.” Id. (holding that because “commands (i.e. software) is so broad . . . one must still look to the specification for an adequate understanding of the structure of that software”). “Code,” like “commands,” connotes software, and does not disclose “a specific physical structure that performs the function.” Id.; see also Williamson v. Citrix Online, LLC, 792 F.3d 1339, 1350-51 (Fed. Cir. 2015) (holding that “module” constituted a generic description for software or hardware that performs a specified function, and did not provide structure).²

The cases cited by Plaintiff in support of the proposition that “code” constitutes sufficient structure are inapposite. In those cases, the claims at issue did not use the term “means.” See, e.g., Affymetrix, Inc. v. Hyseq, Inc., 132 F. Supp. 2d 1212, 1232 (N.D. Cal. 2001); Aloft Media, LLC v. Adobe Systems Inc., 570 F. Supp. 2d 887, 897-98 (E.D. Tex. 2008). A presumption therefore existed *against*, not *in favor of*, means-plus-function treatment. Consequently, Affymetrix and Aloft merely held that inclusion of the words “computer code” did not transform a claim into a means-plus-function limitation. See Computer Acceleration Corp. v. Microsoft Corp., 516 F. Supp. 2d 752, 764 (E.D. Tex. 2007) (distinguishing cases in which a presumption exists *against* means-plus-function treatment from cases in which a presumption exists *in favor of* such treatment).

Accordingly, having determined that Claim 15 is subject to means-plus-function treatment, the Court finds that Claim 15 (like Claim 14) is indefinite.

² Indeed, the Court notes that there are different types of “code.” See Bernstein v. U.S. Dep’t of State, 922 F. Supp. 1426, 1429 & n.3 (N.D. Cal. 1996) (describing “source code” and “object code”) (citing Encyclopedia of Computer Science 962, 1262-64 (Anthony Ralston & Edwin D. Reilly eds., 3d ed. 1995)).

1 **III. CONCLUSION**

2 For the reasons stated above,

3 IT IS HEREBY ORDERED THAT:

4 1. The term “reference points” means “points that form a test pattern.”

5 2. The term “image aspects” means “feature of the corneal image.”

6 3. The phrase “said image having image aspects in an image coordinate system
7 and including reflections of said reference points” requires no construction.

8 4. Claims 14 and 15 are invalid as indefinite for failing to disclose structure
9 corresponding to the claimed functions.

10 5. The parties shall appear for a telephonic Case Management Conference on
11 **February 24, 2016 at 2:30 p.m.** At least seven (7) calendar days prior to the conference,
12 the parties shall meet and confer and file a Joint Case Management Statement in accordance
13 with Civil Local Rule 16-9. Plaintiff’s counsel shall be responsible for filing the Joint Case
14 Management Statement and setting up the conference call. At the date and time indicated
15 above, Plaintiff’s counsel shall call (510) 879-3550 with all parties on the line. NO
16 PARTY SHALL OTHERWISE CONTACT CHAMBERS DIRECTLY WITHOUT PRIOR
17 AUTHORIZATION OF THE COURT.

18 IT IS SO ORDERED.

19 Dated: 1/22/16

20 
21 SAUNDRA BROWN ARMSTRONG
22 Senior United States District Judge
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